

SEQUENCE LISTING

<110> Clark, Mike A.
 <120> Methods for Inhibiting Viral Replication in vivo
 <130> PHOE0001-100
 <150> US 60/427,497
 <151> 2002-11-18
 <160> 21
 <170> PatentIn version 3.2
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 35 40 45
 Leu Glu Ser His Asp Ala Arg Lys Glu His Gln Ser Phe Val Lys Ile
 50 55 60
 Met Lys Asp Arg Gly Ile Asn Val Val Glu Leu Thr Asp Leu Val Ala
 65 70 75 80
 Glu Thr Tyr Asp Leu Ala Ser Lys Ala Ala Lys Glu Glu Phe Ile Glu
 85 90 95
 Thr Phe Leu Glu Glu Thr Val Pro Val Leu Thr Glu Ala Asn Lys Lys
 100 105 110
 Ala Val Arg Ala Phe Leu Leu Ser Lys Pro Thr His Glu Met Val Glu
 115 120 125
 Phe Met Met Ser Gly Ile Thr Lys Tyr Glu Leu Gly Val Glu Ser Glu
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 Asn Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg Asp
 145 150 155 160

Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg Tyr
165 170 175

Ile Val Arg Arg Arg Glu Thr Leu Phe Ala Arg Phe Val Phe Arg Asn
180 185 190

His Pro Lys Leu Val Lys Thr Pro Trp Tyr Tyr Asp Pro Ala Met Lys
195 200 205

Met Pro Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Glu Thr Leu
210 215 220

Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Ile Thr Leu Leu
225 230 235 240

Ala Lys Asn Ile Lys Ala Asn Lys Glu Val Glu Phe Lys Arg Ile Val
245 250 255

Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Thr Trp
260 265 270

Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala Asn
275 280 285

Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala Glu
290 295 300

Pro Gln Pro Gln Leu Asn Gly Leu Pro Leu Asp Lys Leu Leu Ala Ser
305 310 315 320

Ile Ile Asn Lys Glu Pro Val Leu Ile Pro Ile Gly Gly Ala Gly Ala
325 330 335

Thr Glu Met Glu Ile Ala Arg Glu Thr Asn Phe Asp Gly Thr Asn Tyr
340 345 350

Leu Ala Ile Lys Pro Gly Leu Val Ile Gly Tyr Asp Arg Asn Glu Lys
355 360 365

Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Thr Val Leu Pro Phe His
370 375 380

Gly Asn Gln Leu Ser Leu Gly Met Gly Asn Ala Arg Cys Met Ser Met
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Pro Leu Ser Arg Lys Asp Val Lys Trp
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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu His Gln Ser Phe Val Lys Ile
50 55 60

Met Lys Asp Arg Gly Ile Asn Val Val Glu Leu Thr Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Lys Ala Ala Lys Glu Glu Phe Ile Glu
85 90 95

Thr Phe Leu Glu Glu Thr Val Pro Val Leu Thr Glu Ala Asn Lys Glu
100 105 110

Ala Val Arg Ala Phe Leu Leu Ser Lys Pro Thr His Glu Met Val Glu
115 120 125

Phe Met Met Ser Gly Ile Thr Lys Tyr Glu Leu Gly Val Glu Ser Glu
130 135 140

Asn Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg Asp
145 150 155 160

Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg Tyr
165 170 175

Ile Val Arg Arg Arg Glu Thr Leu Phe Ala Arg Phe Val Phe Arg Asn
180 185 190

His Pro Lys Leu Val Lys Thr Pro Trp Tyr Tyr Asp Pro Ala Met Lys
 195 200 205

Met Pro Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Glu Thr Leu
 210 215 220

Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Ile Thr Leu Leu
 225 230 235 240

Ala Lys Asn Ile Lys Ala Asn Lys Glu Val Glu Phe Lys Arg Ile Val
 245 250 255

Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Thr Trp
 260 265 270

Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala Asn
 275 280 285

Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala Glu
 290 295 300

Pro Gln Pro Gln Leu Asn Gly Leu Pro Leu Asp Lys Leu Leu Ala Ser
 305 310 315 320

Ile Ile Asn Lys Glu Pro Val Leu Ile Pro Ile Gly Gly Ala Gly Ala
 325 330 335

Thr Glu Met Glu Ile Ala Arg Glu Thr Asn Phe Asp Gly Thr Asn Tyr
 340 345 350

Leu Ala Ile Lys Pro Gly Leu Val Ile Gly Tyr Asp Arg Asn Glu Lys
 355 360 365

Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Thr Val Leu Pro Phe His
 370 375 380

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Pro Leu Ser Arg Lys Asp Val Lys Trp
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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu His Gln Ser Phe Val Lys Ile
50 55 60

Met Lys Asp Arg Gly Ile Asn Val Val Glu Leu Thr Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Lys Ala Ala Lys Glu Glu Phe Ile Glu
85 90 95

Thr Phe Leu Glu Glu Thr Val Pro Val Leu Thr Glu Ala Asn Lys Lys
100 105 110

Ala Val Arg Ala Phe Leu Leu Ser Lys Pro Thr His Glu Met Val Glu
115 120 125

Phe Met Met Ser Gly Ile Thr Lys Tyr Glu Leu Gly Val Glu Ser Glu
130 135 140

Asn Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg Asp
145 150 155 160

Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg Tyr
165 170 175

Ile Val Arg Arg Arg Glu Thr Leu Phe Ala Arg Phe Val Phe Arg Asn
180 185 190

His Pro Lys Leu Val Lys Thr Pro Trp Tyr Tyr Asp Pro Ala Met Lys
195 200 205

Met Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Glu Thr Leu
210 215 220

Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Ile Thr Leu Leu

225 230 235 240

Ala Lys Asn Ile Lys Ala Asn Lys Glu Val Glu Phe Lys Arg Ile Val
245 250 255

Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Thr Trp
260 265 270

Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala Asn
275 280 285

Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala Glu
290 295 300

Pro Gln Pro Gln Leu Asn Gly Leu Pro Leu Asp Lys Leu Leu Ala Ser
305 310 315 320

Ile Ile Asn Lys Glu Pro Val Leu Ile Pro Ile Gly Gly Ala Gly Ala
325 330 335

Thr Glu Met Glu Ile Ala Arg Glu Thr Asn Phe Asp Gly Thr Asn Tyr
340 345 350

Leu Ala Ile Lys Pro Gly Leu Val Ile Gly Tyr Asp Arg Asn Glu Lys
355 360 365

Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Thr Val Leu Pro Phe His
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Pro Leu Ser Arg Lys Asp Val Lys Trp
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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
 35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu His Gln Ser Phe Val Lys Ile
 50 55 60

Met Lys Asp Arg Gly Ile Asn Val Val Glu Leu Thr Asp Leu Val Ala
 65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Lys Ala Ala Lys Glu Glu Phe Ile Glu
 85 90 95

Thr Phe Leu Glu Glu Thr Val Pro Val Leu Thr Glu Ala Asn Lys Glu
 100 105 110

Ala Val Arg Ala Phe Leu Leu Ser Lys Pro Thr His Glu Met Val Glu
 115 120 125

Phe Met Met Ser Gly Ile Thr Lys Tyr Glu Leu Gly Val Glu Ser Glu
 130 135 140

Asn Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg Asp
 145 150 155 160

Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg Tyr
 165 170 175

Ile Val Arg Arg Arg Glu Thr Leu Phe Ala Arg Phe Val Phe Arg Asn
 180 185 190

His Pro Lys Leu Val Lys Thr Pro Trp Tyr Tyr Asp Pro Ala Met Lys
 195 200 205

Met Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Glu Thr Leu
 210 215 220

Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Ile Thr Leu Leu
 225 230 235 240

Ala Lys Asn Ile Lys Ala Asn Lys Glu Val Glu Phe Lys Arg Ile Val
 245 250 255

Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Thr Trp
 260 265 270

Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala Asn
275 280 285

Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala Glu
290 295 300

Pro Gln Pro Gln Leu Asn Gly Leu Pro Leu Asp Lys Leu Leu Ala Ser
305 310 315 320

Ile Ile Asn Lys Glu Pro Val Leu Ile Pro Ile Gly Gly Ala Gly Ala
325 330 335

Thr Glu Met Glu Ile Ala Arg Glu Thr Asn Phe Asp Gly Thr Asn Tyr
340 345 350

Leu Ala Ile Lys Pro Gly Leu Val Ile Gly Tyr Asp Arg Asn Glu Lys
355 360 365

Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Thr Val Leu Pro Phe His
370 375 380

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385 390 395 400

Pro Leu Ser Arg Lys Asp Val Lys Trp
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20 25 30

Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu His Lys Gln Phe Val Ala Glu
50 55 60

Leu Lys Ala Asn Asp Ile Asn Val Val Glu Leu Ile Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Gln Glu Ala Lys Asp Lys Leu Ile Glu
85 90 95

Glu Phe Leu Glu Asp Ser Glu Pro Val Leu Ser Glu Glu His Lys Val
100 105 110

Val Val Arg Asn Phe Leu Lys Ala Lys Lys Thr Ser Arg Lys Leu Val
115 120 125

Glu Ile Met Met Ala Gly Ile Thr Lys Tyr Asp Leu Gly Ile Glu Ala
130 135 140

Asp His Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Tyr Met Arg
165 170 175

Tyr Lys Val Arg Gln Arg Glu Thr Leu Phe Ser Arg Phe Val Phe Ser
180 185 190

Asn His Pro Lys Leu Ile Asn Thr Pro Trp Tyr Tyr Asp Pro Ser Leu
195 200 205

Lys Leu Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Asp Thr
210 215 220

Leu Val Val Gly Val Ser Glu Arg Thr Asp Leu Gln Thr Val Thr Leu
225 230 235 240

Leu Ala Lys Asn Ile Val Ala Asn Lys Glu Cys Glu Phe Lys Arg Ile
245 250 255

Val Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Thr
260 265 270

Trp Leu Thr Met Leu Asp Lys Asp Lys Phe Leu Tyr Ser Pro Ile Ala
275 280 285

Asn Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala
290 295 300

Glu Pro Gln Pro Val Glu Asn Gly Leu Pro Leu Glu Gly Leu Leu Gln
305 310 315 320

Ser Ile Ile Asn Lys Lys Pro Val Leu Ile Pro Ile Ala Gly Glu Gly
325 330 335

Ala Ser Gln Met Glu Ile Glu Arg Glu Thr His Phe Asp Gly Thr Asn
340 345 350

Tyr Leu Ala Ile Arg Pro Gly Val Val Ile Gly Tyr Ser Arg Asn Glu
355 360 365

Lys Thr Asn Ala Ala Leu Glu Ala Ala Gly Ile Lys Val Leu Pro Phe
370 375 380

His Gly Asn Gln Leu Ser Leu Gly Met Gly Asn Ala Arg Cys Met Ser
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Met Pro Leu Ser Arg Lys Asp Val Lys Trp
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20 25 30

Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu His Lys Gln Phe Val Ala Glu
50 55 60

Leu Lys Ala Asn Asp Ile Asn Val Val Glu Leu Ile Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Gln Glu Ala Lys Asp Lys Leu Ile Glu
85 90 95

Glu Phe Leu Glu Asp Ser Glu Pro Val Leu Ser Glu Glu His Glu Val
100 105 110

Val Val Arg Asn Phe Leu Lys Ala Lys Lys Thr Ser Arg Lys Leu Val
115 120 125

Glu Ile Met Met Ala Gly Ile Thr Lys Tyr Asp Leu Gly Ile Glu Ala
130 135 140

Asp His Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Tyr Met Arg
165 170 175

Tyr Lys Val Arg Gln Arg Glu Thr Leu Phe Ser Arg Phe Val Phe Ser
180 185 190

Asn His Pro Lys Leu Ile Asn Thr Pro Trp Tyr Tyr Asp Pro Ser Leu
195 200 205

Lys Leu Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Asp Thr
210 215 220

Leu Val Val Gly Val Ser Glu Arg Thr Asp Leu Gln Thr Val Thr Leu
225 230 235 240

Leu Ala Lys Asn Ile Val Ala Asn Lys Glu Cys Glu Phe Lys Arg Ile
245 250 255

Val Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Thr
260 265 270

Trp Leu Thr Met Leu Asp Lys Asp Lys Phe Leu Tyr Ser Pro Ile Ala
275 280 285

Asn Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala
290 295 300

Glu Pro Gln Pro Val Glu Asn Gly Leu Pro Leu Glu Gly Leu Leu Gln
305 310 315 320

Ser Ile Ile Asn Lys Lys Pro Val Leu Ile Pro Ile Ala Gly Glu Gly
325 330 335

Ala Ser Gln Met Glu Ile Glu Arg Glu Thr His Phe Asp Gly Thr Asn
340 345 350

Tyr Leu Ala Ile Arg Pro Gly Val Val Ile Gly Tyr Ser Arg Asn Glu
355 360 365

Lys Thr Asn Ala Ala Leu Glu Ala Ala Gly Ile Lys Val Leu Pro Phe
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Met Pro Leu Ser Arg Lys Asp Val Lys Trp
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<213> Mycoplasma arthritidis

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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu Gln Ser Gln Phe Val Ala Ile
50 55 60

Leu Lys Ala Asn Asp Ile Asn Val Val Glu Thr Ile Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Gln Glu Ala Lys Asp Arg Leu Ile Glu
85 90 95

Glu Phe Leu Glu Asp Ser Glu Pro Val Leu Ser Glu Ala His Lys Lys
100 105 110

Val Val Arg Asn Phe Leu Lys Ala Lys Lys Thr Ser Arg Lys Leu Val
115 120 125

Glu Leu Met Met Ala Gly Ile Thr Lys Tyr Asp Leu Gly Val Glu Ala
130 135 140

Asp His Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg
165 170 175

Tyr Ile Val Arg Arg Arg Glu Thr Leu Phe Ser Arg Phe Val Phe Arg
180 185 190

Asn His Pro Lys Leu Val Asn Thr Pro Trp Tyr Tyr Asp Pro Ala Met
195 200 205

Lys Leu Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Asp Thr
210 215 220

Leu Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Val Thr Leu
225 230 235 240

Leu Ala Lys Asn Leu Val Ala Asn Lys Glu Cys Glu Phe Lys Arg Ile
245 250 255

Val Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Ile
260 265 270

Trp Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala
275 280 285

Asn Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala
290 295 300

Glu Pro Gln Pro Val Glu Asn Gly Leu Pro Leu Glu Lys Leu Leu Gln
305 310 315 320

Ser Ile Ile Asn Lys Lys Pro Val Leu Ile Pro Ile Ala Gly Glu Gly
325 330 335

Ala Ser Gln Met Glu Ile Glu Arg Glu Thr His Phe Asp Gly Thr Asn
340 345 350

Tyr Ile Ala Ile Arg Pro Gly Val Val Ile Gly Tyr Ser Arg Asn Glu
355 360 365

Lys Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Lys Val Leu Pro Phe
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Met Pro Leu Ser Arg Lys Asp Val Lys
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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu Gln Ser Gln Phe Val Ala Ile
50 55 60

Leu Lys Ala Asn Asp Ile Asn Val Val Glu Thr Ile Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Gln Glu Ala Lys Asp Arg Leu Ile Glu
85 90 95

Glu Phe Leu Glu Asp Ser Glu Pro Val Leu Ser Glu Ala His Glu Glu
100 105 110

Val Val Arg Asn Phe Leu Lys Ala Lys Lys Thr Ser Arg Lys Leu Val
115 120 125

Glu Leu Met Met Ala Gly Ile Thr Lys Tyr Asp Leu Gly Val Glu Ala
130 135 140

Asp His Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg
165 170 175

Tyr Ile Val Arg Arg Arg Glu Thr Leu Phe Ser Arg Phe Val Phe Arg
180 185 190

Asn His Pro Lys Leu Val Asn Thr Pro Trp Tyr Tyr Asp Pro Ala Met
195 200 205

Lys Leu Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Asp Thr
210 215 220

Leu Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Val Thr Leu
225 230 235 240

Leu Ala Lys Asn Leu Val Ala Asn Lys Glu Cys Glu Phe Lys Arg Ile
245 250 255

Val Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Ile
260 265 270

Trp Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala
275 280 285

Asn Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala
290 295 300

Glu Pro Gln Pro Val Glu Asn Gly Leu Pro Leu Glu Lys Leu Leu Gln
305 310 315 320

Ser Ile Ile Asn Lys Lys Pro Val Leu Ile Pro Ile Ala Gly Glu Gly
325 330 335

Ala Ser Gln Met Glu Ile Glu Arg Glu Thr His Phe Asp Gly Thr Asn
340 345 350

Tyr Ile Ala Ile Arg Pro Gly Val Val Ile Gly Tyr Ser Arg Asn Glu
355 360 365

Lys Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Lys Val Leu Pro Phe
370 375 380

His Gly Asn Gln Leu Ser Leu Gly Met Gly Asn Ala Arg Cys Met Ser
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Met Pro Leu Ser Arg Lys Asp Val Lys
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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu Gln Ser Gln Phe Val Ala Ile
50 55 60

Leu Lys Ala Asn Asp Ile Asn Val Val Glu Thr Ile Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Gln Glu Ala Lys Asp Arg Leu Ile Glu
85 90 95

Glu Phe Leu Glu Asp Ser Glu Pro Val Leu Ser Glu Ala His Glu Lys
100 105 110

Val Val Arg Asn Phe Leu Lys Ala Lys Lys Thr Ser Arg Lys Leu Val
115 120 125

Glu Leu Met Met Ala Gly Ile Thr Lys Tyr Asp Leu Gly Val Glu Ala
130 135 140

Asp His Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg
165 170 175

Tyr Ile Val Arg Arg Arg Glu Thr Leu Phe Ser Arg Phe Val Phe Arg
180 185 190

Asn His Pro Lys Leu Val Asn Thr Pro Trp Tyr Tyr Asp Pro Ala Met

195 200 205
 Lys Leu Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Asp Thr
 210 215 220
 Leu Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Val Thr Leu
 225 230 235 240
 Leu Ala Lys Asn Leu Val Ala Asn Lys Glu Cys Glu Phe Lys Arg Ile
 245 250 255
 Val Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Ile
 260 265 270
 Trp Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala
 275 280 285
 Asn Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala
 290 295 300
 Glu Pro Gln Pro Val Glu Asn Gly Leu Pro Leu Glu Lys Leu Leu Gln
 305 310 315 320
 Ser Ile Ile Asn Lys Lys Pro Val Leu Ile Pro Ile Ala Gly Glu Gly
 325 330 335
 Ala Ser Gln Met Glu Ile Glu Arg Glu Thr His Phe Asp Gly Thr Asn
 340 345 350
 Tyr Ile Ala Ile Arg Pro Gly Val Val Ile Gly Tyr Ser Arg Asn Glu
 355 360 365
 Lys Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Lys Val Leu Pro Phe
 370 375 380
 His Gly Asn Gln Leu Ser Leu Gly Met Gly Asn Ala Arg Cys Met Ser
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 Met Pro Leu Ser Arg Lys Asp Val Lys
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<400> 10

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Asp Tyr Ile Thr Pro Ala Arg Leu Asp Glu Leu Leu Phe Ser Ala Ile
35 40 45

Leu Glu Ser His Asp Ala Arg Lys Glu Gln Ser Gln Phe Val Ala Ile
50 55 60

Leu Lys Ala Asn Asp Ile Asn Val Val Glu Thr Ile Asp Leu Val Ala
65 70 75 80

Glu Thr Tyr Asp Leu Ala Ser Gln Glu Ala Lys Asp Arg Leu Ile Glu
85 90 95

Glu Phe Leu Glu Asp Ser Glu Pro Val Leu Ser Glu Ala His Lys Glu
100 105 110

Val Val Arg Asn Phe Leu Lys Ala Lys Lys Thr Ser Arg Lys Leu Val
115 120 125

Glu Leu Met Met Ala Gly Ile Thr Lys Tyr Asp Leu Gly Val Glu Ala
130 135 140

Asp His Glu Leu Ile Val Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Phe Ala Ser Val Gly Asn Gly Val Thr Ile His Phe Met Arg
165 170 175

Tyr Ile Val Arg Arg Arg Glu Thr Leu Phe Ser Arg Phe Val Phe Arg
180 185 190

Asn His Pro Lys Leu Val Asn Thr Pro Trp Tyr Tyr Asp Pro Ala Met
195 200 205

Lys Leu Ser Ile Glu Gly Gly Asp Val Phe Ile Tyr Asn Asn Asp Thr
210 215 220

Leu Val Val Gly Val Ser Glu Arg Thr Asp Leu Asp Thr Val Thr Leu
225 230 235 240

Leu Ala Lys Asn Leu Val Ala Asn Lys Glu Cys Glu Phe Lys Arg Ile
245 250 255

Val Ala Ile Asn Val Pro Lys Trp Thr Asn Leu Met His Leu Asp Ile
260 265 270

Trp Leu Thr Met Leu Asp Lys Asn Lys Phe Leu Tyr Ser Pro Ile Ala
275 280 285

Asn Asp Val Phe Lys Phe Trp Asp Tyr Asp Leu Val Asn Gly Gly Ala
290 295 300

Glu Pro Gln Pro Val Glu Asn Gly Leu Pro Leu Glu Lys Leu Leu Gln
305 310 315 320

Ser Ile Ile Asn Lys Lys Pro Val Leu Ile Pro Ile Ala Gly Glu Gly
325 330 335

Ala Ser Gln Met Glu Ile Glu Arg Glu Thr His Phe Asp Gly Thr Asn
340 345 350

Tyr Ile Ala Ile Arg Pro Gly Val Val Ile Gly Tyr Ser Arg Asn Glu
355 360 365

Lys Thr Asn Ala Ala Leu Lys Ala Ala Gly Ile Lys Val Leu Pro Phe
370 375 380

His Gly Asn Gln Leu Ser Leu Gly Met Gly Asn Ala Arg Cys Met Ser
385 390 395 400

Met Pro Leu Ser Arg Lys Asp Val Lys
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<212> PRT
<213> Streptococcus pyogenes

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20 25 30

Pro Asp Tyr Leu Glu Arg Leu Leu Phe Asp Asp Ile Pro Phe Leu Glu
35 40 45

Asp Ala Gln Lys Glu His Asp Ala Phe Ala Gln Ala Leu Arg Asp Glu
50 55 60

Gly Ile Glu Val Leu Tyr Leu Glu Thr Leu Ala Ala Glu Ser Leu Val
65 70 75 80

Thr Pro Glu Ile Arg Glu Ala Phe Ile Asp Glu Tyr Leu Ser Glu Ala
85 90 95

Asn Ile Arg Gly Arg Ala Thr Lys Lys Ala Ile Arg Glu Leu Leu Met
100 105 110

Ala Ile Glu Asp Asn Gln Glu Leu Ile Glu Lys Thr Met Ala Gly Val
115 120 125

Gln Lys Ser Glu Leu Pro Glu Ile Pro Ala Ser Glu Lys Gly Leu Thr
130 135 140

Asp Leu Val Glu Ser Asn Tyr Pro Phe Ala Ile Asp Pro Met Pro Asn
145 150 155 160

Leu Tyr Phe Thr Arg Asp Pro Phe Ala Thr Ile Gly Thr Gly Val Ser
165 170 175

Leu Asn His Met Phe Ser Glu Thr Arg Asn Arg Glu Thr Leu Tyr Gly
 180 185 190

Lys Tyr Ile Phe Thr His His Pro Ile Tyr Gly Gly Gly Lys Val Pro
 195 200 205

Met Val Tyr Asp Arg Asn Glu Thr Thr Arg Ile Glu Gly Gly Asp Glu
 210 215 220

Leu Val Leu Ser Lys Asp Val Leu Ala Val Gly Ile Ser Gln Arg Thr
 225 230 235 240

Asp Ala Ala Ser Ile Glu Lys Leu Leu Val Asn Ile Phe Lys Gln Asn
 245 250 255

Leu Gly Phe Lys Lys Val Leu Ala Phe Glu Phe Ala Asn Asn Arg Lys
 260 265 270

Phe Met His Leu Asp Thr Val Phe Thr Met Val Asp Tyr Asp Lys Phe
 275 280 285

Thr Ile His Pro Glu Ile Glu Gly Asp Leu Arg Val Tyr Ser Val Thr
 290 295 300

Tyr Asp Asn Glu Glu Leu His Ile Val Glu Glu Lys Gly Asp Leu Ala
 305 310 315 320

Glu Leu Leu Ala Ala Asn Leu Gly Val Glu Lys Val Asp Leu Ile Arg
 325 330 335

Cys Gly Gly Asp Asn Leu Val Ala Ala Gly Arg Glu Gln Trp Asn Asp
 340 345 350

Gly Ser Asn Thr Leu Thr Ile Ala Pro Gly Val Val Val Val Tyr Asn
 355 360 365

Arg Asn Thr Ile Thr Asn Ala Ile Leu Glu Ser Lys Gly Leu Lys Leu
 370 375 380

Ile Lys Ile His Gly Ser Glu Leu Val Arg Gly Arg Gly Gly Pro Arg
 385 390 395 400

Cys Met Ser Met Pro Phe Glu Arg Glu Asp Ile
 405 410

<210> 14
 <211> 409
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 14

Met Ser Ser His Pro Ile Gln Val Phe Ser Glu Ile Gly Lys Leu Lys
 1 5 10 15

Lys Val Met Leu His Arg Pro Gly Lys Glu Leu Glu Asn Leu Leu Pro
 20 25 30

Asp Tyr Leu Glu Arg Leu Leu Phe Asp Asp Ile Pro Phe Leu Glu Asp
 35 40 45

Ala Gln Lys Glu His Asp Ala Phe Ala Gln Ala Leu Arg Asp Glu Gly
 50 55 60

Ile Glu Val Leu Tyr Leu Glu Gln Leu Ala Ala Glu Ser Leu Thr Ser
 65 70 75 80

Pro Glu Ile Arg Asp Gln Phe Ile Glu Glu Tyr Leu Asp Glu Ala Asn
 85 90 95

Ile Arg Asp Arg Gln Thr Lys Val Ala Ile Arg Glu Leu Leu His Gly
 100 105 110

Ile Lys Asp Asn Gln Glu Leu Val Glu Lys Thr Met Ala Gly Ile Gln
 115 120 125

Lys Val Glu Leu Pro Glu Ile Pro Asp Glu Ala Lys Asp Leu Thr Asp
 130 135 140

Leu Val Glu Ser Glu Tyr Pro Phe Ala Ile Asp Pro Met Pro Asn Leu
 145 150 155 160

Tyr Phe Thr Arg Asp Pro Phe Ala Thr Ile Gly Asn Ala Val Ser Leu
 165 170 175

Asn His Met Phe Ala Asp Thr Arg Asn Arg Glu Thr Leu Tyr Gly Lys
 180 185 190

Tyr Ile Phe Lys Tyr His Pro Ile Tyr Gly Gly Lys Val Asp Leu Val
 195 200 205

Tyr Asn Arg Glu Glu Asp Thr Arg Ile Glu Gly Gly Asp Glu Leu Val

210 215 220
 Leu Ser Lys Asp Val Leu Ala Val Gly Ile Ser Gln Arg Thr Asp Ala
 225 230 235 240
 Ala Ser Ile Glu Lys Leu Leu Val Asn Ile Phe Lys Lys Asn Val Gly
 245 250 255
 Phe Lys Lys Val Leu Ala Phe Glu Phe Ala Asn Asn Arg Lys Phe Met
 260 265 270
 His Leu Asp Thr Val Phe Thr Met Val Asp Tyr Asp Lys Phe Thr Ile
 275 280 285
 His Pro Glu Ile Glu Gly Asp Leu His Val Tyr Ser Val Thr Tyr Glu
 290 295 300
 Asn Glu Lys Leu Lys Ile Val Glu Glu Lys Gly Asp Leu Ala Glu Leu
 305 310 315 320
 Leu Ala Gln Asn Leu Gly Val Glu Lys Val His Leu Ile Arg Cys Gly
 325 330 335
 Gly Gly Asn Ile Val Ala Ala Ala Arg Glu Gln Trp Asn Asp Gly Ser
 340 345 350
 Asn Thr Leu Thr Ile Ala Pro Gly Val Val Val Val Tyr Asp Arg Asn
 355 360 365
 Thr Val Thr Asn Lys Ile Leu Glu Glu Tyr Gly Leu Arg Leu Ile Lys
 370 375 380
 Ile Arg Gly Ser Glu Leu Val Arg Gly Arg Gly Gly Pro Arg Cys Met
 385 390 395 400
 Ser Met Pro Phe Glu Arg Glu Glu Val
 405

<210> 15
 <211> 410
 <212> PRT
 <213> Borrelia burgdorferi

<400> 15

Met Glu Glu Glu Tyr Leu Asn Pro Ile Asn Ile Phe Ser Glu Ile Gly
 1 5 10 15

Arg Leu Lys Lys Val Leu Leu His Arg Pro Gly Glu Glu Leu Glu Asn
20 25 30

Leu Thr Pro Leu Ile Met Lys Asn Phe Leu Phe Asp Asp Ile Pro Tyr
35 40 45

Leu Lys Val Ala Arg Gln Glu His Glu Val Phe Val Asn Ile Leu Lys
50 55 60

Asp Asn Ser Val Glu Ile Glu Tyr Val Glu Asp Leu Val Ser Glu Val
65 70 75 80

Leu Ala Ser Ser Val Ala Leu Lys Asn Lys Phe Ile Ser Gln Phe Ile
85 90 95

Leu Glu Ala Glu Ile Lys Thr Asp Gly Val Ile Asn Ile Leu Lys Asp
100 105 110

Tyr Phe Ser Asn Leu Thr Val Asp Asn Met Val Ser Lys Met Ile Ser
115 120 125

Gly Val Ala Arg Glu Glu Leu Lys Asp Cys Glu Phe Ser Leu Asp Asp
130 135 140

Trp Val Asn Gly Ser Ser Leu Phe Val Ile Asp Pro Met Pro Asn Val
145 150 155 160

Leu Phe Thr Arg Asp Pro Phe Ala Ser Ile Gly Asn Gly Ile Thr Ile
165 170 175

Asn Lys Met Tyr Thr Lys Val Arg Arg Arg Glu Thr Ile Phe Ala Glu
180 185 190

Tyr Ile Phe Lys Tyr His Ser Ala Tyr Lys Glu Asn Val Pro Ile Trp
195 200 205

Phe Asn Arg Trp Glu Glu Thr Ser Leu Glu Gly Gly Asp Glu Phe Val
210 215 220

Leu Asn Lys Asp Leu Leu Val Ile Gly Ile Ser Glu Arg Thr Glu Ala
225 230 235 240

Gly Ser Val Glu Lys Leu Ala Ala Ser Leu Phe Lys Asn Lys Ala Pro
245 250 255

Phe Ser Thr Ile Leu Ala Phe Lys Ile Pro Lys Asn Arg Ala Tyr Met
260 265 270

His Leu Asp Thr Val Phe Thr Gln Ile Asp Tyr Ser Val Phe Thr Ser
275 280 285

Phe Thr Ser Asp Asp Met Tyr Phe Ser Ile Tyr Val Leu Thr Tyr Asn
290 295 300

Ser Asn Ser Asn Lys Ile Asn Ile Lys Lys Glu Lys Ala Lys Leu Lys
305 310 315 320

Asp Val Leu Ser Phe Tyr Leu Gly Arg Lys Ile Asp Ile Ile Lys Cys
325 330 335

Ala Gly Gly Asp Leu Ile His Gly Ala Arg Glu Gln Trp Asn Asp Gly
340 345 350

Ala Asn Val Leu Ala Ile Ala Pro Gly Glu Val Ile Ala Tyr Ser Arg
355 360 365

Asn His Val Thr Asn Lys Leu Phe Glu Glu Asn Gly Ile Lys Val His
370 375 380

Arg Ile Pro Ser Ser Glu Leu Ser Arg Gly Arg Gly Gly Pro Arg Cys
385 390 395 400

Met Ser Met Ser Leu Val Arg Glu Asp Ile
405 410

<210> 16

<211> 409

<212> PRT

<213> Borellia afzellii

<400> 16

Met Glu Glu Tyr Leu Asn Pro Ile Asn Ile Phe Ser Glu Ile Gly Arg
1 5 10 15

Leu Lys Lys Val Leu Leu His Arg Pro Gly Glu Glu Leu Glu Asn Leu
20 25 30

Thr Pro Phe Ile Met Lys Asn Phe Leu Phe Asp Asp Ile Pro Tyr Leu
35 40 45

Glu Val Ala Arg Gln Glu His Glu Val Phe Ala Ser Ile Leu Lys Asn
 50 55 60

Asn Leu Val Glu Ile Glu Tyr Ile Glu Asp Leu Ile Ser Glu Val Leu
 65 70 75 80

Val Ser Ser Val Ala Leu Glu Asn Lys Phe Ile Ser Gln Phe Ile Leu
 85 90 95

Glu Ala Glu Ile Lys Thr Asp Phe Thr Ile Asn Leu Leu Lys Asp Tyr
 100 105 110

Phe Ser Ser Leu Thr Ile Asp Asn Met Ile Ser Lys Met Ile Ser Gly
 115 120 125

Val Val Thr Glu Glu Leu Lys Asn Tyr Thr Ser Ser Leu Asp Asp Leu
 130 135 140

Val Asn Gly Ala Asn Leu Phe Ile Ile Asp Pro Met Pro Asn Val Leu
 145 150 155 160

Phe Thr Arg Asp Pro Phe Ala Ser Ile Gly Asn Gly Val Thr Ile Asn
 165 170 175

Lys Met Phe Thr Lys Val Arg Gln Arg Glu Thr Ile Phe Ala Glu Tyr
 180 185 190

Ile Phe Lys Tyr His Pro Val Tyr Lys Glu Asn Val Pro Ile Trp Leu
 195 200 205

Asn Arg Trp Glu Glu Ala Ser Leu Glu Gly Gly Asp Glu Leu Val Leu
 210 215 220

Asn Lys Gly Leu Leu Val Ile Gly Ile Ser Glu Arg Thr Glu Ala Lys
 225 230 235 240

Ser Val Glu Lys Leu Ala Ile Ser Leu Phe Lys Asn Lys Thr Ser Phe
 245 250 255

Asp Thr Ile Leu Ala Phe Gln Ile Pro Lys Asn Arg Ser Tyr Met His
 260 265 270

Leu Asp Thr Val Phe Thr Gln Ile Asp Tyr Ser Val Phe Thr Ser Phe
 275 280 285

Thr Ser Asp Asp Met Tyr Phe Ser Ile Tyr Val Leu Thr Tyr Asn Pro
290 295 300

Ser Ser Ser Lys Ile His Ile Lys Lys Glu Lys Ala Arg Ile Lys Asp
305 310 315 320

Val Leu Ser Phe Tyr Leu Gly Arg Lys Ile Asp Ile Ile Lys Cys Ala
325 330 335

Gly Gly Asp Leu Ile His Gly Ala Arg Glu Gln Trp Asn Asp Gly Ala
340 345 350

Asn Val Leu Ala Ile Ala Pro Gly Glu Ile Ile Ala Tyr Ser Arg Asn
355 360 365

His Val Thr Asn Lys Leu Phe Glu Glu Asn Gly Ile Lys Val His Arg
370 375 380

Ile Pro Ser Ser Glu Leu Ser Arg Gly Arg Gly Gly Pro Arg Cys Met
385 390 395 400

Ser Met Pro Leu Ile Arg Glu Asp Ile
405

<210> 17
<211> 580
<212> PRT
<213> Giardia intestinalis

<400> 17

Met Thr Asp Phe Ser Lys Asp Lys Glu Lys Leu Ala Gln Ala Thr Gln
1 5 10 15

Gly Gly Glu Asn Glu Arg Ala Glu Ile Val Val Val His Leu Pro Gln
20 25 30

Gly Thr Ser Phe Leu Thr Ser Leu Asn Pro Glu Gly Asn Leu Leu Glu
35 40 45

Glu Pro Ile Cys Pro Asp Glu Leu Arg Arg Asp His Glu Gly Phe Gln
50 55 60

Ala Val Leu Lys Glu Lys Gly Cys Arg Val Tyr Met Pro Tyr Asp Val
65 70 75 80

Leu Ser Glu Ala Ser Pro Ala Glu Arg Glu Val Leu Met Asp Gln Ala
85 90 95

Met Ala Ser Leu Lys Tyr Glu Leu His Ala Thr Gly Ala Arg Ile Thr
100 105 110

Pro Lys Met Lys Tyr Cys Val Ser Asp Glu Tyr Lys Arg Lys Val Leu
115 120 125

Ser Ala Leu Ser Thr Arg Asn Leu Val Asp Val Ile Leu Ser Glu Pro
130 135 140

Val Ile His Leu Ala Pro Gly Val Arg Asn Thr Ala Leu Val Thr Asn
145 150 155 160

Ser Val Glu Ile His Asp Ser Asn Asn Met Val Phe Met Arg Asp Gln
165 170 175

Gln Ile Thr Thr Arg Arg Gly Ile Val Met Gly Gln Phe Gln Ala Pro
180 185 190

Gln Arg Arg Arg Glu Gln Val Leu Ala Leu Ile Phe Trp Lys Arg Leu
195 200 205

Gly Ala Arg Val Val Gly Asp Cys Arg Glu Gly Gly Pro His Cys Met
210 215 220

Leu Glu Gly Gly Asp Phe Val Pro Val Ser Pro Gly Leu Ala Met Met
225 230 235 240

Gly Val Gly Leu Arg Ser Thr Tyr Val Gly Ala Gln Tyr Leu Met Ser
245 250 255

Lys Asp Leu Leu Gly Thr Arg Arg Phe Ala Val Val Lys Asp Cys Phe
260 265 270

Asp Gln His Gln Asp Arg Met His Leu Asp Cys Thr Phe Ser Val Leu
275 280 285

His Asp Lys Leu Val Val Leu Asp Asp Tyr Ile Cys Ser Gly Met Gly
290 295 300

Leu Arg Tyr Val Asp Glu Trp Ile Asp Val Gly Ala Asp Ala Val Lys
305 310 315 320

Lys Ala Lys Ser Ser Ala Val Thr Cys Gly Asn Tyr Val Leu Ala Lys
325 330 335

Ala Asn Val Glu Phe Gln Gln Trp Leu Ser Glu Asn Gly Tyr Thr Ile
340 345 350

Val Arg Ile Pro His Glu Tyr Gln Leu Ala Tyr Gly Cys Asn Asn Leu
355 360 365

Asn Leu Gly Asn Asn Cys Val Leu Ser Val His Gln Pro Thr Val Asp
370 375 380

Phe Ile Lys Ala Asp Pro Ala Tyr Ile Ser Tyr Cys Lys Ser Asn Asn
385 390 395 400

Leu Pro Asn Gly Leu Asp Leu Val Tyr Val Pro Phe Arg Gly Ile Thr
405 410 415

Arg Met Tyr Gly Ser Leu His Cys Ala Ser Gln Val Val Tyr Arg Thr
420 425 430

Pro Leu Ala Pro Ala Ala Val Lys Ala Cys Glu Gln Glu Gly Asp Gly
435 440 445

Ile Ala Ala Ile Tyr Glu Lys Asn Gly Glu Pro Val Asp Ala Ala Gly
450 455 460

Lys Lys Phe Asp Cys Val Ile Tyr Ile Pro Ser Ser Val Asp Asp Leu
465 470 475 480

Ile Asp Gly Leu Lys Ile Asn Leu Arg Asp Asp Ala Ala Pro Ser Arg
485 490 495

Glu Ile Ile Ala Asp Ala Tyr Gly Leu Tyr Gln Lys Leu Val Ser Glu
500 505 510

Gly Arg Val Pro Tyr Ile Thr Trp Arg Met Pro Ser Met Pro Val Val
515 520 525

Ser Leu Lys Gly Ala Ala Lys Ala Gly Ser Leu Lys Ala 'Val Leu Asp
530 535 540

Lys Ile Pro Gln Leu Thr Pro Phe Thr Pro Lys Ala Val Glu Gly Ala
545 550 555 560

Pro Ala Ala Tyr Thr Arg Tyr Leu Gly Leu Glu Gln Ala Asp Ile Cys
565 570 575

Val Asp Ile Lys
580

<210> 18
<211> 413
<212> PRT
<213> Clostridium perfringens

<400> 18

Met Arg Asp Asp Arg Ala Leu Asn Val Thr Ser Glu Ile Gly Arg Leu
1 5 10 15

Lys Thr Val Leu Leu His Arg Pro Gly Glu Glu Ile Glu Asn Leu Thr
20 25 30

Pro Asp Leu Leu Asp Arg Leu Leu Phe Asp Asp Ile Pro Tyr Leu Lys
35 40 45

Val Ala Arg Glu Glu His Asp Ala Phe Ala Gln Thr Leu Arg Glu Ala
50 55 60

Gly Val Glu Val Leu Tyr Leu Glu Val Leu Ala Ala Glu Ala Ile Glu
65 70 75 80

Thr Ser Asp Glu Val Lys Gln Gln Phe Ile Ser Glu Phe Ile Asp Glu
85 90 95

Ala Gly Val Glu Ser Glu Arg Leu Lys Glu Ala Leu Ile Glu Tyr Phe
100 105 110

Asn Ser Phe Ser Asp Asn Lys Ala Met Val Asp Lys Met Met Ala Gly
115 120 125

Val Arg Lys Glu Glu Leu Lys Asp Tyr His Arg Glu Ser Leu Tyr Asp
130 135 140

Gln Val Asn Asn Val Tyr Pro Phe Val Cys Asp Pro Met Pro Asn Leu
145 150 155 160

Tyr Phe Thr Arg Glu Pro Phe Ala Thr Ile Gly His Gly Ile Thr Leu
165 170 175

Asn His Met Arg Thr Asp Thr Arg Asn Arg Glu Thr Ile Phe Ala Lys

180

185

190

Tyr Ile Phe Arg His His Pro Arg Phe Glu Gly Lys Asp Ile Pro Phe
 195 200 205

Trp Phe Asn Arg Asn Asp Lys Thr Ser Leu Glu Gly Gly Asp Glu Leu
 210 215 220

Ile Leu Ser Lys Glu Ile Leu Ala Val Gly Ile Ser Gln Arg Thr Asp
 225 230 235 240

Ser Ala Ser Val Glu Lys Leu Ala Lys Lys Leu Leu Tyr Tyr Pro Asp
 245 250 255

Thr Ser Phe Lys Thr Val Leu Ala Phe Lys Ile Pro Val Ser Arg Ala
 260 265 270

Phe Met His Leu Asp Thr Val Phe Thr Gln Val Asp Tyr Asp Lys Phe
 275 280 285

Thr Val His Pro Gly Ile Val Gly Pro Leu Glu Val Tyr Ala Leu Thr
 290 295 300

Lys Asp Pro Glu Asn Asp Gly Gln Leu Leu Val Thr Glu Glu Val Asp
 305 310 315 320

Thr Leu Glu Asn Ile Leu Lys Lys Tyr Leu Asp Arg Asp Ile Lys Leu
 325 330 335

Ile Lys Cys Gly Gly Gly Asp Glu Ile Ile Ala Ala Arg Glu Gln Trp
 340 345 350

Asn Asp Gly Ser Asn Thr Leu Ala Ile Ala Pro Gly Glu Val Val Val
 355 360 365

Tyr Ser Arg Asn Tyr Val Thr Asn Glu Ile Leu Glu Lys Glu Gly Ile
 370 375 380

Lys Leu His Val Ile Pro Ser Ser Glu Leu Ser Arg Gly Arg Gly Gly
 385 390 395 400

Pro Arg Cys Met Ser Met Pro Leu Ile Arg Glu Asp Leu
 405 410

<210> 19

<211> 413
<212> PRT
<213> Bacillus licheniformis

<400> 19

Met Ile Met Thr Thr Pro Ile His Val Tyr Ser Glu Ile Gly Pro Leu
1 5 10 15

Lys Thr Val Met Leu Lys Arg Pro Gly Arg Glu Leu Glu Asn Leu Thr
20 25 30

Pro Glu Tyr Leu Glu Arg Leu Leu Phe Asp Asp Ile Pro Phe Leu Pro
35 40 45

Ala Val Gln Lys Glu His Asp Gln Phe Ala Glu Thr Leu Lys Gln Gln
50 55 60

Gly Ala Glu Val Leu Tyr Leu Glu Lys Leu Thr Ala Glu Ala Leu Asp
65 70 75 80

Asp Ala Leu Val Arg Glu Gln Phe Ile Asp Glu Leu Leu Thr Glu Ser
85 90 95

Lys Ala Asp Ile Asn Gly Ala Tyr Asp Arg Leu Lys Glu Phe Leu Leu
100 105 110

Thr Phe Asp Ala Asp Ser Met Val Glu Gln Val Met Ser Gly Ile Arg
115 120 125

Lys Asn Glu Leu Glu Arg Glu Lys Lys Ser His Leu His Glu Leu Met
130 135 140

Glu Asp His Tyr Pro Phe Tyr Leu Asp Pro Met Pro Asn Leu Tyr Phe
145 150 155 160

Thr Arg Asp Pro Ala Ala Ala Ile Gly Ser Gly Leu Thr Ile Asn Lys
165 170 175

Met Lys Glu Pro Ala Arg Arg Arg Glu Ser Leu Phe Met Arg Tyr Ile
180 185 190

Ile Asn His His Pro Arg Phe Lys Gly His Glu Ile Pro Val Trp Leu
195 200 205

Asp Arg Asp Phe Lys Phe Asn Ile Glu Gly Gly Asp Glu Leu Val Leu
210 215 220

Asn Glu Glu Thr Val Ala Ile Gly Val Ser Glu Arg Thr Thr Ala Gln
225 230 235 240

Ala Ile Glu Arg Leu Val Arg Asn Leu Phe Gln Arg Gln Ser Arg Ile
245 250 255

Arg Arg Val Leu Ala Val Glu Ile Pro Lys Ser Arg Ala Phe Met His
260 265 270

Leu Asp Thr Val Phe Thr Met Val Asp Arg Asp Gln Phe Thr Ile His
275 280 285

Pro Ala Ile Gln Gly Pro Glu Gly Asp Met Arg Ile Phe Val Leu Glu
290 295 300

Arg Gly Lys Thr Ala Asp Glu Ile His Thr Thr Glu Glu His Asn Leu
305 310 315 320

Pro Glu Val Leu Lys Arg Thr Leu Gly Leu Ser Asp Val Asn Leu Ile
325 330 335

Phe Cys Gly Gly Gly Asp Glu Ile Ala Ser Ala Arg Glu Gln Trp Asn
340 345 350

Asp Gly Ser Asn Thr Leu Ala Ile Ala Pro Gly Val Val Val Thr Tyr
355 360 365

Asp Arg Asn Tyr Ile Ser Asn Glu Cys Leu Arg Glu Gln Gly Ile Lys
370 375 380

Val Ile Glu Ile Pro Ser Gly Glu Leu Ser Arg Gly Arg Gly Gly Pro
385 390 395 400

Arg Cys Met Ser Met Pro Leu Tyr Arg Glu Asp Val Lys
405 410

<210> 20

<211> 408

<212> PRT

<213> Enterococcus faecalis

<400> 20

Met Ser His Pro Ile Asn Val Phe Ser Glu Ile Gly Lys Leu Lys Thr
1 5 10 15

Val Met Leu His Arg Pro Gly Lys Glu Leu Glu Asn Leu Met Pro Asp
20 25 30

Tyr Leu Glu Arg Leu Leu Phe Asp Asp Ile Pro Phe Leu Glu Lys Ala
35 40 45

Gln Ala Glu His Asp Ala Phe Ala Glu Leu Leu Arg Ser Lys Asp Ile
50 55 60

Glu Val Val Tyr Leu Glu Asp Leu Ala Ala Glu Ala Leu Ile Asn Glu
65 70 75 80

Glu Val Arg Arg Gln Phe Ile Asp Gln Phe Leu Glu Glu Ala Asn Ile
85 90 95

Arg Ser Glu Ser Ala Lys Glu Lys Val Arg Glu Leu Met Leu Glu Ile
100 105 110

Asp Asp Asn Glu Glu Leu Ile Gln Lys Ala Ile Ala Gly Ile Gln Lys
115 120 125

Gln Glu Leu Pro Lys Tyr Glu Gln Glu Phe Leu Thr Asp Met Val Glu
130 135 140

Ala Asp Tyr Pro Phe Ile Ile Asp Pro Met Pro Asn Leu Tyr Phe Thr
145 150 155 160

Arg Asp Asn Phe Ala Thr Met Gly His Gly Ile Ser Leu Asn His Met
165 170 175

Tyr Ser Val Thr Arg Gln Arg Glu Thr Ile Phe Gly Gln Tyr Ile Phe
180 185 190

Asp Tyr His Pro Arg Phe Ala Gly Lys Glu Val Pro Arg Val Tyr Asp
195 200 205

Arg Ser Glu Ser Thr Arg Ile Glu Gly Gly Asp Glu Leu Ile Leu Ser
210 215 220

Lys Glu Val Val Ala Ile Gly Ile Ser Gln Arg Thr Asp Ala Ala Ser
225 230 235 240

Ile Glu Lys Ile Ala Arg Asn Ile Phe Glu Gln Lys Leu Gly Phe Lys
245 250 255

Asn Ile Leu Ala Phe Asp Ile Gly Glu His Arg Lys Phe Met His Leu
260 265 270

Asp Thr Val Phe Thr Met Ile Asp Tyr Asp Lys Phe Thr Ile His Pro
275 280 285

Glu Ile Glu Gly Gly Leu Val Val Tyr Ser Ile Thr Glu Lys Ala Asp
290 295 300

Gly Asp Ile Gln Ile Thr Lys Glu Lys Asp Thr Leu Asp Asn Ile Leu
305 310 315 320

Cys Lys Tyr Leu His Leu Asp Asn Val Gln Leu Ile Arg Cys Gly Ala
325 330 335

Gly Asn Leu Thr Ala Ala Ala Arg Glu Gln Trp Asn Asp Gly Ser Asn
340 345 350

Thr Leu Ala Ile Ala Pro Gly Glu Val Val Val Tyr Asp Arg Asn Thr
355 360 365

Ile Thr Asn Lys Ala Leu Glu Glu Ala Gly Val Lys Leu Asn Tyr Ile
370 375 380

Pro Gly Ser Glu Leu Val Arg Gly Arg Gly Gly Pro Arg Cys Met Ser
385 390 395 400

Met Pro Leu Tyr Arg Glu Asp Leu
405

<210> 21
<211> 409
<212> PRT
<213> Lactobacillus sake

<400> 21

Met Thr Ser Pro Ile His Val Asn Ser Glu Ile Gly Lys Leu Lys Thr
1 5 10 15

Val Leu Leu Lys Arg Pro Gly Lys Glu Val Glu Asn Ile Thr Pro Asp
20 25 30

Ile Met Tyr Arg Leu Leu Phe Asp Asp Ile Pro Tyr Leu Pro Thr Ile
35 40 45

Gln Lys Glu His Asp Gln Phe Ala Gln Thr Leu Arg Asp Asn Gly Val
50 55 60

Glu Val Leu Tyr Leu Glu Asn Leu Ala Ala Glu Ala Ile Asp Ala Gly
65 70 75 80

Asp Val Lys Glu Ala Phe Leu Asp Lys Met Leu Asn Glu Ser His Ile
85 90 95

Lys Ser Pro Gln Val Gln Ala Ala Leu Lys Asp Tyr Leu Ile Ser Met
100 105 110

Ala Thr Leu Asp Met Val Glu Lys Ile Met Ala Gly Val Arg Thr Asn
115 120 125

Glu Ile Asp Ile Lys Ser Lys Ala Leu Ile Asp Val Ser Ala Asp Asp
130 135 140

Asp Tyr Pro Phe Tyr Met Asp Pro Met Pro Asn Leu Tyr Phe Thr Arg
145 150 155 160

Asp Pro Ala Ala Ser Met Gly Asp Gly Leu Thr Ile Asn Lys Met Thr
165 170 175

Phe Glu Ala Arg Gln Arg Glu Ser Met Phe Met Glu Val Ile Met Gln
180 185 190

His His Pro Arg Phe Ala Asn Gln Gly Ala Gln Val Trp Arg Asp Arg
195 200 205

Asp His Ile Asp Arg Met Glu Gly Gly Asp Glu Leu Ile Leu Ser Asp
210 215 220

Lys Val Leu Ala Ile Gly Ile Ser Gln Arg Thr Ser Ala Gln Ser Ile
225 230 235 240

Glu Glu Leu Ala Lys Val Leu Phe Ala Asn His Ser Gly Phe Glu Lys
245 250 255

Ile Leu Ala Ile Lys Ile Pro His Lys His Ala Met Met His Leu Asp
260 265 270

Thr Val Phe Thr Met Ile Asp Tyr Asp Lys Phe Thr Ile His Pro Gly
275 280 285

Ile Gln Gly Ala Gly Gly Met Val Asp Thr Tyr Ile Leu Glu Pro Gly
290 295 300

Asn Asn Asp Glu Ile Lys Ile Thr His Gln Thr Asp Leu Glu Lys Val
305 310 315 320

Leu Arg Asp Ala Leu Glu Val Pro Glu Leu Thr Leu Ile Pro Cys Gly
325 330 335

Gly Gly Asp Ala Val Val Ala Pro Arg Glu Gln Trp Asn Asp Gly Ser
340 345 350

Asn Thr Leu Ala Ile Ala Pro Gly Val Val Val Thr Tyr Asp Arg Asn
355 360 365

Tyr Val Ser Asn Glu Asn Leu Arg Gln Tyr Gly Ile Lys Val Ile Glu
370 375 380

Val Pro Ser Ser Glu Leu Ser Arg Gly Arg Gly Gly Pro Arg Cys Met
385 390 395 400

Ser Met Pro Leu Val Arg Arg Lys Thr
405